

CLAIMS

We claim:

- 1 1. A computer implemented method comprising:
2 selecting an updated set of attributes in a routing table before selecting a set of
3 updated destinations associated with the selected set of attributes; and
4 generating an update message that includes the set of updated destinations for the set
5 of attributes.
- 1 2. The computer implemented method of claim 1 wherein the routing table includes a
2 destination data structure that includes the set of updated destinations, a set of path data
3 structures, and an attribute data structure that includes an entry indicating the updated set of
4 attributes.
- 1 3. The computer implemented method of claim 2 wherein the destination data structure
2 is a radix trie.
- 1 4. The computer implemented method of claim 2 wherein the destination data structure
2 is a hash table.
- 1 5. The computer implemented method of claim 1 wherein the updated set of attributes
2 reference the set of updated destinations.
- 1 6. The computer implemented method of claim 1 wherein the set of set of updated
2 destinations is a linked list and the updated set of attributes reference the linked list's head.
- 1 6. The computer implemented method of claim 1 wherein the set of set of
2 updated destinations is a linked list and the updated set of attributes reference the linked list's
3 head and tail.

- 1 8. The computer implemented method of claim 1 further comprising:
2 a selecting a dummy attribute before selecting a second set of updated destinations;
3 and
4 generating a second update message indicating the second set of updated destinations
5 as unreachable.
- 1 9. A computer implemented method comprising:
2 selecting a first data structure, the first data structure corresponding to a best path to a
3 destination;
4 referencing a first element of a second data structure from the selected first data
5 structure, the first element indicating a set of attributes of the best path; and
6 referencing a second element of a third data structure from the first element, the
7 second element indicating the destination.
- 1 10. The computer implemented method of claim 9 further comprising:
2 selecting the first element in the second data structure;
3 tracing a chain of elements of the third data structure from the selected first element;
4 creating an update message, the network update message indicating the set of
5 attributes;
6 indicating a set of destinations that are indicated by the chain of elements in the
7 update message; and
8 transmitting the network update message.
- 1 11. The computer implemented method of claim 9 further comprising:
2 determining a second destination to be unreachable; and
3 referencing a third element of the third data structure from a dummy element of the
4 second data structure, the third element indicating the second destination.

- 1 12. The computer implemented method of claim 9 wherein the second data structure is a
2 hash table.
- 1 13. The computer implemented method of claim 9 wherein the third data structure is a
2 radix trie.
- 1 14. A network device comprising:
2 a memory to host a routing table, the routing table to include a first data structure to
3 indicate a set of destinations and a second data structure to indicate a set of
4 attributes; and
5 a set of one or more processors coupled with the memory, the set of processors to
6 process a network update message that indicates one of the set of destinations
7 and a subset of the set of attributes and to insert the one of the set of
8 destinations into a chain of elements of the first data structure in accordance
9 with the network update message, the chain to be referenced by an element of
10 the second data structure that indicates the subset of the set of attributes.
- 1 15. The network device of claim 14 wherein the first data structure is a radix trie.
- 1 16. The network device of claim 14 wherein the second data structure is a hash table.
- 1 17. The network device of claim 14 further comprising the set of processors to insert a
2 second element of the first data structure into a second attribute-oriented chain that is
3 referenced by a dummy element of the second data structure.
- 1 18. The network device of claim 14 further comprising the set of processors to trace the
2 attributed oriented chain of elements, to generate a second network update message, and to
3 indicate a subset of the set of destinations in the second network update message, the subset
4 of destinations indicated by the attribute-oriented chain of elements.

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a first network device to transmit an update message that indicates a destination and a first set of attributes that describes a path; and
a second network device coupled with the first network device, the second network device to host a routing table that includes a first data structure that indicates destinations and a second data structure that indicates attributes, to receive the update message, to reference a first element of the first data structure that indicates the destination from a second element of the second data structure, the second element of the second data structure indicating the set of attributes.

25. The system of claim 24 further comprising the second network device to select the second element of the second data structure, to trace an attribute-oriented chain of elements from the second element, the attribute-oriented chain of elements including the first element, to create a second update message, to identify the set of attributes and a set of destinations in the second update message, the set of attributes indicated by the second element and the set of destinations indicated by the attribute-oriented chain of elements, and to transmit the second update message.

26. The system of claim 24 further comprising:
the first network device to transmit a withdraw message, the withdraw message indicating a second destination as unreachable; and
the second network device to receive the withdraw message and to insert a fourth element of the first data structure into a attribute-oriented referenced by a dummy element of the second data structure, the fourth element to indicate the second destination.

27. The system of claim 24 wherein the first data structure is a radix trie.

28. The system of claim 24 wherein the second data structure is a hash table.

1 29. A machine readable medium, which when executed by a set of one or more
2 processors, cause said set of processors to perform operations comprising:
3 selecting an updated set of attributes in a routing table before selecting a set of
4 updated destinations associated with the selected set of attributes; and
5 generating an update message that includes the set of updated destinations for the set
6 of attributes.

1 30. The machine readable medium of claim 29 wherein the routing table includes a
2 destination data structure that includes the set of updated destinations, a set of path data
3 structures, and an attribute data structure that includes an entry indicating the updated set of
4 attributes.

1 31. The machine readable medium of claim 30 wherein the destination data structure is a
2 radix trie.

1 32. The machine readable medium of claim 30 wherein the destination data structure is a
2 hash table.

1 33. The machine readable medium of claim 29 wherein the updated set of attributes
2 reference the set of updated destinations.

1 34. The machine readable medium of claim 29 wherein the set of updated destinations is a
2 linked list and the updated set of attributes reference the linked list's head.

1 35. The machine readable medium of claim 29 wherein the set of set of updated
2 destinations is a linked list and the updated set of attributes reference the linked list's head
3 and tail.

1 36. The machine readable medium of claim 29 further comprising:

2 a selecting a dummy attribute before selecting a second set of updated destinations;
3 and
4 generating a second update message indicating the second set of updated destinations
5 as unreachable.

1 37. A machine readable medium, which when executed by a set of one or more
2 processors, cause said set of processors to perform operations comprising:
3 selecting a first data structure, the first data structure corresponding to a best path to a
4 destination;
5 referencing a first element of a second data structure from the selected first data
6 structure, the first element indicating a set of attributes of the best path; and
7 referencing a second element of a third data structure from the first element, the
8 second element indicating the destination.

1 38. The machine readable medium of claim 37 further comprising:
2 selecting the first element in the second data structure;
3 tracing a chain of elements of the third data structure from the selected first element;
4 creating an update message, the network update message indicating the set of
5 attributes;
6 indicating a set of destinations that are indicated by the chain of elements in the
7 update message; and
8 transmitting the network update message.

1 39. The machine readable medium of claim 37 further comprising:
2 determining a second destination to be unreachable; and
3 referencing a third element of the third data structure from a dummy element of the
4 second data structure, the third element indicating the second destination.

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1 40. The machine readable medium of claim 37 wherein the second data structure is a hash
2 table.

1 41. The machine readable medium of claim 37 wherein the third data structure is a radix
2 trie.

1 42. A machine readable medium, which when executed by a set of one or more
2 processors, cause said set of processors to perform operations comprising:
3 selecting an element of a first data structure that is marked, the element indicating a
4 set of attributes;
5 creating a network update message;
6 indicating the set of attributes in the message; and
7 indicating a set of one or more destinations in the update message, the set of
8 destinations indicated by a set of linked elements of a second data structure,
9 the element of the first data structure referencing the set of linked elements.

1 43. The machine readable medium of claim 42 further comprising:
2 selecting a third data structure, the third data structure corresponding to a best path to
3 a destination;
4 referencing a second element of the first data structure from the selected third data
5 structure, the second element indicating a second set of attributes, the second
6 set of attributes describing the best path; and
7 referencing a third element of the second data structure from the second element, the
8 third element indicating the destination.

1 44. The machine readable medium of claim 42 further comprising:
2 determining a second destination to be unreachable; and
3 referencing a fourth element of the second data structure from a dummy element of
4 the first data structure, the fourth element indicating the second destination.

1 45. The machine readable medium of claim 42 wherein the first data structure is a hash
2 table.

1 46. The machine readable medium of claim 42 wherein the third data structure is a radix
2 trie.

47. A machine-readable medium having a routing table, comprising:

a first data structure including a first field to indicate a destination, a second field to reference the first data structure, a third field to reference a second data structure;

the second data structure including a fourth field to indicate an origin and a fifth field to reference a third data structure; and

a third data structure including a set of fields to indicate a set of attributes describing a path and a sixth field to reference the first data structure.

1 48. The machine-readable medium of claim 47 further comprising the third data structure
2 including a seventh field to indicate the first data structure as a tail of an attribute-oriented
3 chain.

1 49. The machine-readable medium of claim 47 wherein the attribute-oriented chain is a
2 linked list of the first data structure.